MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

BFS1024 – STATISTICS FOR FINANCE

(All sections / Groups)

30 MAY 2018
2.30 p.m. - 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of ELEVEN **(11)** printed pages inclusive of the cover page, formulae sheet and statistical tables.

2. This question paper consists of **FOUR** structured questions. Attempt **ALL** questions.

3. Students are allowed to use non-programmable scientific calculators with no restrictions. Statistical tables are attached at the end of the question paper.

4. Please use **pen** to write the answers.

5. Please print all your answers in the **Answer Booklet** provided.

Question 1 [Total = 25 Marks]

(a) A study was conducted to discover the smoking habits, by race for American males aged 18 to 24. A sample of 1000 respondents was surveyed and 850 of them are White American males. 320 of the American males are smokers while 30 of them are Black.

i) Compute the probability for a selected American male to be White and a smoker. [2 marks]

ii) Compute the probability for a non-smoker to be a Black male. [4 marks]

iii) Assess whether smoking and race are independent events. [4 marks]

(b) Given X a discrete random variable with the following probability distribution.

X	P(x)
2	0.1
5	0.5
8	0.4

i) Compute the expected value and variance of X. [5 marks]

ii) Compute E $(3X^2 - 5X + 10)$. [4 marks]

iii) Compute Var $(5X^2)$. [6 marks]

Question 2 [Total = 25 Marks]

(a) In a certain KFC franchise, three quarter of the customers typically request "hot and spicy" instead of "original". For the next six customers who walked in to KFC,

i) compute the probability that at least 4 of them will request for "hot and spicy". [5 marks]

ii) compute the probability that at most 5 of them will request for "original". [3 marks]

iii) compute the mean and standard deviation for the number of customers who will request for "original". [4 marks]

(b) The time it takes to give a man a shampoo and a haircut is normally distributed with mean 25 minutes and standard deviation of 4 minutes.

i) Compute the probability that a man took less than half an hour to get his hair cut and shampoo. [3 marks]

ii) Compute the probability that a man took between 10 to 15 minutes to get his hair cut and shampoo. [5 marks]

iii) Compute the longest time taken by 92% of the customers for shampoo and haircut. [5 marks]

Continued...

Question 3 [Total = 25 Marks]

Prices for regular unleaded gasoline can widely vary from day to day and location to location. These data were obtained on July 1, 2010, from a sample of stations across the respective state (price is in dollars per gallon):

South Carolina		Michigan	
1.46	1.47	1.69	1.72
1.42	1.51	1.59	1.75
1.55	1.52	1.91	1.64
1.68	1.54	1.89	1.55
1.44	1.65	1.66	1.80
		1.71	1.55

(a) Determine the point estimate for population mean and standard deviation of prices for both locations. [4 marks]

(b) Find the 90% confidence interval for the population proportion for prices above $1.70 per gallon at Michigan. [6 marks]

(c) Determine the sample size required for Michigan to be 99% confidence in the population proportion estimation, given accepted error of 2.5%. [4 marks]

(d) Examine whether we can infer that the prices at Michigan is higher than the price at South Carolina assuming equal population variances. [11 marks]

Question 4 [Total = 25 Marks]

Snowman Ski Resort would like to predict the number of their customers during winter season. The staff collected the information for 20 days including the number of skiers, the thickness of snow (inches) on the ground at noon and the average temperature of the day (degrees Fahrenheit). Partial of the Excel output was reported.

ANOVA

	df	*SS*	*MS*
Regression	2	20431.76	
Residual		372114.8	21889.11
Total			

	Coefficients	*P-value*
Intercept	574.865	3.61E-05
snow	2.318	0.550
temperature	-3.428	0.411

Continued...

(a) Determine the least square regression equation. [4 marks]
(b) Interpret the slope coefficients. [6 marks]
(c) Compute the coefficient of determination for the model and explain the answer. [5 marks]
(d) Examine whether the model is significant at 5% level of significance. [10 marks]

End of Questions

STATISTICAL FORMULAE

A. DESCRIPTIVE STATISTICS

Mean = $\frac{\sum X_i}{n}$

Standard Deviation (s) = $\sqrt{\frac{\sum X^2}{n-1} - \frac{(\sum X)^2}{n(n-1)}}$

Pearson's Coefficient of Skewness (S_k) = $\frac{3(\overline{X} - \text{Median})}{s}$ or $\frac{\overline{X} - \text{Mode}}{s}$

B. PROBABILITY

P (A or B) = P (A) + P (B) - P (A and B)

P (A and B) = P (A) P (B) if A and B are independent

P (A | B) = P (A and B) / P (B)

Poisson Probability Distribution

If X follows a Poisson Distribution P (λ) where $P(X = x) = \frac{e^{-\lambda}\lambda^x}{x!}$

then the mean = E(X) = λ and variance = VAR(X) = λ

Binomial Probability Distribution

If X follows a Binomial Distribution B(n, p) where $P(X = x) = {}^nC_x p^x q^{n-x}$

then the mean = E(X) = n p and variance = VAR(X) = npq where q = 1 - p

Normal Distribution

If X follows a Normal distribution N(μ , σ) where E(X) = μ and VAR(X) = σ^2

then $z = \frac{X - \mu}{\sigma}$

C. EXPECTATION AND VARIANCE OPERATORS

E (X) = $\sum$[X • P(X)]

VAR (X) = E(X^2) - [E(X)] ^{2}

If E (X) = μ then E (kX) = k μ, E(X + Y) = E(X) + E(Y)

If VAR (X) = σ^2 then VAR (kX) = k^2 σ^2,

VAR (aX + bY) = a^2VAR(X) + b^2VAR(Y) + 2ab COV(X, Y)

where COV(X , Y) = E(X Y) – [E(X) E(Y)]

D. CONFIDENCE INTERVAL ESTIMATION AND SAMPLE SIZE DETERMINATION

(100 - α) % Confidence Interval for Population Mean (σ Known) = $\overline{X} \pm Z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right)$

(100 - α)% Confidence Interval for Population Mean (σ Unknown) = $\overline{X} \pm t_{\alpha/2,n-1}\left(\frac{s}{\sqrt{n}}\right)$

(100 - α)% Confidence Interval for Population Proportion = $p \pm Z_{\alpha/2}\sqrt{\frac{p(1-p)}{n}}$

Sample Size Determination for Population Mean $= n \geq \frac{(Z_{\alpha/2})^2 \sigma^2}{E^2}$

Sample Size Determination for Population Proportion $= n \geq \frac{(Z_{\alpha/2})^2 p(1-p)}{E^2}$

Where E = Limit of Error in Estimation

E. HYPOTHESIS TESTING

One Sample Mean Test	
Standard Deviation (σ) Known	**Standard Deviation (σ) Not Known**
$Z = \frac{\overline{x} - \mu}{\sigma/\sqrt{n}}$	$t = \frac{\overline{x} - \mu}{s/\sqrt{n}}$
One Sample Proportion Test	
$Z = \frac{p - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}}$	

Two Sample Mean Test

Standard Deviation (σ) Known

$$z = \frac{(\overline{x_1} - \overline{x_2})}{\sqrt{\sigma_1^2/n_1 + \sigma_2^2/n_2}}$$

Standard Deviation (σ) Not Known

$$t = \frac{(\overline{x_1} - \overline{x_2})}{\sqrt{S_p^2\left(1/n_1 + 1/n_2\right)}} \quad \textbf{where} \quad S_p^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{(n_1 - 1) + (n_2 - 1)}$$

Two Sample Proportion Test

$$z = \frac{(p_1 - p_2)}{\sqrt{p(1-p)\left[\frac{1}{n_1} + \frac{1}{n_2}\right]}} \text{ where } p = \frac{(n_1 p_1) + (n_2 p_2)}{n_1 + n_2} = \frac{X_1 + X_2}{n_1 + n_2}$$

where X_1 and X_2 are the number of successes from each population

F. REGRESSION ANALYSIS

SIMPLE LINEAR REGRESSION:

Correlation Coefficient

$$r = \frac{\Sigma XY - \left[\frac{\Sigma X \Sigma Y}{n}\right]}{\sqrt{\left[\Sigma X^2 - \left(\Sigma X\right)^2/n\right]\left[\Sigma Y^2 - \left(\Sigma Y\right)^2/n\right]}} = \frac{COV(X,Y)}{\sigma_X \sigma_Y}$$

Regression Coefficient

$$b_1 = \frac{\sum XY - \left[\frac{\sum X \sum Y}{n}\right]}{\left[\sum X^2 - \left(\left(\sum X\right)^2/n\right)\right]}, \qquad b_0 = \overline{Y} - b_1 \overline{X}$$

MULTIPLE LINEAR REGRESSION:

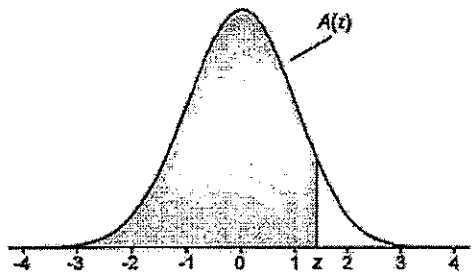
Adjusted r-square $= 1 - \left[\frac{(1-r^2)(n-1)}{(n-p-1)}\right]$ where p = number of independent variables

ANOVA Table for Multiple Linear Regression			
Source	**Degrees of Freedom**	**Sum of Squares**	**Mean Squares**
Regression	p	SSR	MSR = SSR/p
Error	$n-p-1$	SSE	MSE = SSE/$(n-p-1)$
Total	$n-1$	SST	
Test Statistic for Significance of the Overall Regression Model = F = MSR/MSE			
Test Statistic for Significance of each Explanatory Variable = $t^* = b_i / S_{bi}$ and the Critical $t = t_{(n-p-1),\alpha/2}$			

STATISTICAL TABLES 1

TABLE A.1

Cumulative Standardized Normal Distribution

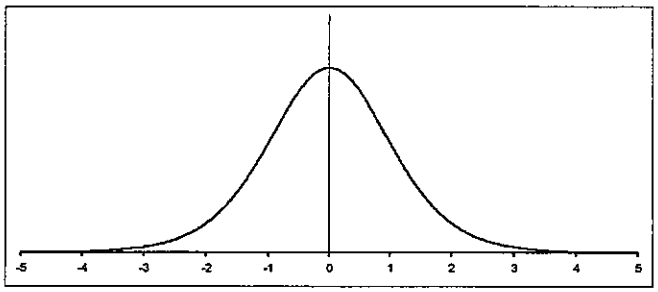


$A(z)$ is the integral of the standardized normal distribution from $-\infty$ to z (in other words, the area under the curve to the left of z). It gives the probability of a normal random variable not being more than z standard deviations above its mean. Values of z of particular importance:

z	$A(z)$	
1.645	0.9500	Lower limit of right 5% tail
1.960	0.9750	Lower limit of right 2.5% tail
2.326	0.9900	Lower limit of right 1% tail
2.576	0.9950	Lower limit of right 0.5% tail
3.090	0.9990	Lower limit of right 0.1% tail
3.291	0.9995	Lower limit of right 0.05% tail

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999							

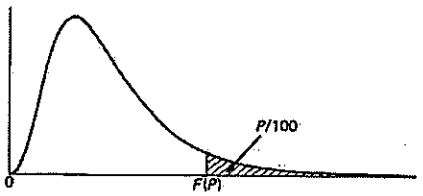
Table 2: The t-distribution ($t_{\alpha, df}$)



α =	0.10	0.05	0.025	0.01	0.005	0.001	0.0005
df = 1	3.078	6.314	12.706	31.821	63.657	318.309	636.619
2	1.886	2.920	4.303	6.965	9.925	22.327	31.599
3	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792
23	1.319	1.714	2.069	2.500	2.807	3.485	3.768
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291

TABLE 12(*b*). 5 PER CENT POINTS OF THE *F*-DISTRIBUTION

If $F = \frac{X_1}{\nu_1} \Big/ \frac{X_2}{\nu_2}$, where X_1 and X_2 are independent random variables distributed as χ^2 with ν_1 and ν_2 degrees of freedom respectively, then the probabilities that $F \geqslant F(P)$ and that $F \leqslant F'(P)$ are both equal to $P/100$. Linear interpolation in ν_1 and ν_2 will generally be sufficiently accurate except when either $\nu_1 > 12$ or $\nu_2 > 40$, when harmonic interpolation should be used.



(This shape applies only when $\nu_1 \geqslant 3$. When $\nu_1 < 3$ the mode is at the origin.)

$\nu_1 =$	1	2	3	4	5	6	7	8	10	12	24	∞
$\nu_2 = 1$	161·4	199·5	215·7	224·6	230·2	234·0	236·8	238·9	241·9	243·9	249·1	254·3
2	18·51	19·00	19·16	19·25	19·30	19·33	19·35	19·37	19·40	19·41	19·45	19·50
3	10·13	9·552	9·277	9·117	9·013	8·941	8·887	8·845	8·786	8·745	8·639	8·526
4	7·709	6·944	6·591	6·388	6·256	6·163	6·094	6·041	5·964	5·912	5·774	5·628
5	6·608	5·786	5·409	5·192	5·050	4·950	4·876	4·818	4·735	4·678	4·527	4·365
6	5·987	5·143	4·757	4·534	4·387	4·284	4·207	4·147	4·060	4·000	3·841	3·669
7	5·591	4·737	4·347	4·120	3·972	3·866	3·787	3·726	3·637	3·575	3·410	3·230
8	5·318	4·459	4·066	3·838	3·687	3·581	3·500	3·438	3·347	3·284	3·115	2·928
9	5·117	4·256	3·863	3·633	3·482	3·374	3·293	3·230	3·137	3·073	2·900	2·707
10	4·965	4·103	3·708	3·478	3·326	3·217	3·135	3·072	2·978	2·913	2·737	2·538
11	4·844	3·982	3·587	3·357	3·204	3·095	3·012	2·948	2·854	2·788	2·609	2·404
12	4·747	3·885	3·490	3·259	3·106	2·996	2·913	2·849	2·753	2·687	2·505	2·296
13	4·667	3·806	3·411	3·179	3·025	2·915	2·832	2·767	2·671	2·604	2·420	2·206
14	4·600	3·739	3·344	3·112	2·958	2·848	2·764	2·699	2·602	2·534	2·349	2·131
15	4·543	3·682	3·287	3·056	2·901	2·790	2·707	2·641	2·544	2·475	2·288	2·066
16	4·494	3·634	3·239	3·007	2·852	2·741	2·657	2·591	2·494	2·425	2·235	2·010
17	4·451	3·592	3·197	2·965	2·810	2·699	2·614	2·548	2·450	2·381	2·190	1·960
18	4·414	3·555	3·160	2·928	2·773	2·661	2·577	2·510	2·412	2·342	2·150	1·917
19	4·381	3·522	3·127	2·895	2·740	2·628	2·544	2·477	2·378	2·308	2·114	1·878
20	4·351	3·493	3·098	2·866	2·711	2·599	2·514	2·447	2·348	2·278	2·082	1·843
21	4·325	3·467	3·072	2·840	2·685	2·573	2·488	2·420	2·321	2·250	2·054	1·812
22	4·301	3·443	3·049	2·817	2·661	2·549	2·464	2·397	2·297	2·226	2·028	1·783
23	4·279	3·422	3·028	2·796	2·640	2·528	2·442	2·375	2·275	2·204	2·005	1·757
24	4·260	3·403	3·009	2·776	2·621	2·508	2·423	2·355	2·255	2·183	1·984	1·733
25	4·242	3·385	2·991	2·759	2·603	2·490	2·405	2·337	2·236	2·165	1·964	1·711
26	4·225	3·369	2·975	2·743	2·587	2·474	2·388	2·321	2·220	2·148	1·946	1·691
27	4·210	3·354	2·960	2·728	2·572	2·459	2·373	2·305	2·204	2·132	1·930	1·672
28	4·196	3·340	2·947	2·714	2·558	2·445	2·359	2·291	2·190	2·118	1·915	1·654
29	4·183	3·328	2·934	2·701	2·545	2·432	2·346	2·278	2·177	2·104	1·901	1·638
30	4·171	3·316	2·922	2·690	2·534	2·421	2·334	2·266	2·165	2·092	1·887	1·622
32	4·149	3·295	2·901	2·668	2·512	2·399	2·313	2·244	2·142	2·070	1·864	1·594
34	4·130	3·276	2·883	2·650	2·494	2·380	2·294	2·225	2·123	2·050	1·843	1·569
36	4·113	3·259	2·866	2·634	2·477	2·364	2·277	2·209	2·106	2·033	1·824	1·547
38	4·098	3·245	2·852	2·619	2·463	2·349	2·262	2·194	2·091	2·017	1·808	1·527
40	4·085	3·232	2·839	2·606	2·449	2·336	2·249	2·180	2·077	2·003	1·793	1·509
60	4·001	3·150	2·758	2·525	2·368	2·254	2·167	2·097	1·993	1·917	1·700	1·389
120	3·920	3·072	2·680	2·447	2·290	2·175	2·087	2·016	1·910	1·834	1·608	1·254
∞	3·841	2·996	2·605	2·372	2·214	2·099	2·010	1·938	1·831	1·752	1·517	1·000